



USEPA / PADEP – PennTAP
Pennsylvania E3 Pilot Program
(Economy, Energy and Environment)

NP-963111
Final Report

**For Period of October 1, 2011
Through September 30, 2013**

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Exhibits (Will be sent as email attachments separate from this report)

- A. Link to PennTAP E3 Informational Webinar
- B. E3 Training Curriculum Slides
- C. Final Reports for E3 Pilot Company Projects (Keystone Powdered Metals; Osram-Sylvania; St. Marys Carbon; GKN Powdered Metals)
- D. Current E3 Metrics Report on E3 PA Pilot Company Implementation Results
- E. E3 Case Study / Success Story (Keystone Powdered Metals, St. Marys, PA)
- F. E3 Pilot Company Financial Match Contribution Letters Received (as of 9/30/13)
- G. WPPSEF Competitive Loan Application Document (Loans are open for review year round, and grants are once/yr. opportunity to compete)



1. Project Partners

- USEPA via Pennsylvania Department of Environmental Protection (PADEP); Office of Pollution Prevention and Energy Assistance
 - o Provided full grant administrative oversight of E3 initiative in Pennsylvania.
- Penn State University's Pennsylvania Technical Assistance Program (PennTAP)
 - o Lead partner responsible for overall project activity and partner collaboration (Training, E3 audits, data collection, analysis, and reporting).
- Northwest Industrial Resource Center (NWIRC)
 - o Produced willing company participants from their ongoing industrial assistance relationships. Also provided the Lean / Value Stream Mapping training for E3 Pilot companies.
- West Penn Power Sustainable Energy Fund (WPPSEF)
 - o Partner support and finance vehicle for low interest loans directly related to energy efficiency implementation(s).



2. Executive Summary/ Project Overview

This project was designed to deliver a comprehensive set of activities to complete an Economy, Energy, and Environment (E3) pilot project in Pennsylvania. The activities focused on performing E3 pilot audits to demonstrate how projects might be done in the future in an effort to replicate, scale and sustain E3 in Pennsylvania and EPA Region III. The program included partners from Pennsylvania interested in advancing the mission of E3, including the PADEP, PennTAP, the PA IRC network, Penn State University, West Penn Power Sustainable Energy Fund (WPPSEF), and private industry. Activities included:

- Performing E3 pilot project audits/assessments/and training
- Developing Energy, Environmental, and Lean Efficiency Recommendations
- Encouraging Pilot Companies to Implement Recommendations
- Educating students about E3
- Promoting and Coordinating E3 Activities within PA and EPA Region III

The project addressed small and medium sized (SME) manufacturers and focused on helping these clients reduce GHG emissions through energy efficiency gains and reduce overall manufacturing wastes. Training was provided, as well as technical assistance, guidance and targeted follow-ups, to insure the possibility of implementation of energy and environmentally friendly cost saving solutions.

The program was started in late 2011 by meeting partners and identifying possible companies to participate in the E3 pilot process. Four companies were eventually selected based upon their commitment to embrace the E3 concepts and follow the guidance of the E3 partner team. All four companies were trained in various E3 concepts – based upon the areas they decided to focus on throughout the project. Lean, energy efficiency and environmental management principles were reviewed simultaneously as the projects progressed.



Once training and assessment/audits were completed, a report was written and delivered to the manufacturing company outlining projects that could be implemented to achieve the most GHG emissions reductions and cost savings. The following table outlines the projected results of those project implementations.

(Expected Results from Final E3 Reports of Implementation Recommendations)

Company	Elec. Reduction (kWh/yr)	Natural Gas Reduction (ccf/yr)	Cost Savings (\$/yr)	GHG Savings (Metric tons/yr)	ACTUAL \$s Invested (match) by each company through 9/30/2013 in E3 Pilot Projects	ADDITIONAL \$s Committed to E3 Project Recommendations Beyond 9/30/2013
Keystone PM	7,527,104	0	\$246,171	4,989	\$111,326	\$300,000+
Osram-Sylvania	2,241,379	0	\$220,000	1,581	\$45,892	No report from client
St. Marys Carbon	0	13,925	\$8,750	76	\$267,000	No report from client
GKN Sintered Metals	342,000	0	\$24,000	241	No report from client	No report from client
Totals:	10,110,483	13,925	\$498,921	6,887	\$424,218	\$300,000+

3. Deliverables Review

Conduct Promotional E3 Events to Identify SME E3 Pilot Clients

PennTAP approached this deliverable in a few different ways. We advertised the PA Pilot Opportunity to our statewide database of clients that PennTAP has engaged with over the past years. This database was mined for companies that identified themselves as small to medium enterprise (SME) companies consisting of less than 500 employees. We sent email blasts to these companies that included a flyer describing the opportunity to participate as an E3 PA Pilot company; and what their commitment and requirements would be if selected. We also offered and promoted two online webinars that allowed Pennsylvania SME companies to participate in an E3 Pilot presentation that included question and answer periods. In addition, we video/audio archived the first webinar on our PennTAP website so participants that could not attend live could get the information (see **Exhibit A** for web link). Simultaneously, we also solicited the help of our PA Industrial Resource Center Partners (IRCs). We gave presentations to the business consultants at IMC and the Northwest IRC (NWIRC) and asked that they promote the E3 pilot opportunities to their SME clients via email, newsletters, and press releases; which they did. We also agreed to subcontract the Lean portion of the training to the IRC that successfully helped convince a qualified company to participate. The overall results of these efforts provided 4 companies that volunteered and committed to participate in the E3 Pilot Project via our partnership with the NWIRC.



Develop and Provide E3 Training Curriculum for Client Personnel

PennTAP approached this deliverable by reviewing the current materials that we could identify relating to the E3 components of Lean, Energy and Environmental efficiencies. PennTAP also had various portions of training developed from past projects that had direct application to our E3 training tasks. After having our E3 Graduate student review various materials found via web searches, and previously used by PennTAP, we developed a slide deck that can be used by future E3 training providers that are seeking to give a one-day overview of E3 concepts prior to engaging in the in-plant audits and assessments. The training slide decks are included as **Exhibit B**. (In addition, some supplemental materials can be found via EPA source sites)

Perform E3 Pilot Projects with SME Industrial Clients

PennTAP performed four pilot E3 projects with four SME companies during this grant program. As we met with each company, we took a consultative approach by asking the management teams what method of investigation would be most beneficial to their operating bottom line. In each case, the companies chose to focus the E3 approach on specific systems within their facilities that they felt deserved a closer look and could potentially produce implementation recommendations that would provide efficiency gains, cost reductions, and GHG emissions reductions. The most significant energy uses and sources of waste were identified and prioritized during these reviews.

After initial plant personnel meetings and plant walk-through discussing strategies, the E3 efforts began by selecting the team of employees that best fit the overall focus of the assessments. We then implemented the following strategies for each company. Each company was also provided the training sessions that corresponded to the sub-projects they were to participate in.

1. *Keystone Powdered Metal* : (two sub-projects)
 - a. Energy and Environmental assessment to identify waste reduction and energy saving opportunities site-wide with economic analysis to identify priority opportunities.
 - b. Economic assessment using Lean Technique of Quick Changeover Evaluation applied to a production process. Focus on typical parameters such as activity value, number of operators, cycle times, changeover times, batch size and yield.
2. *St. Marys Carbon Company*: (two sub-projects)
 - a. Energy and Environmental assessment in which a cross-functional team is established to identify and implement process changes to reduce waste and reduce energy consumption during the baking process.
 - b. Economic assessment using a Lean Manufacturing technique of Value Stream Mapping (VSM) applied to a production process. The facility's pump rotors and vanes production process was chosen for this activity.
3. *Osram-Sylvania* : (two sub-projects)
 - a. Use the Lean Manufacturing VSM tool in a single three-day event to assess and identify opportunities to reduce energy consumption in a specific production support activity (compressed air production, distribution and use)



- b. Use VSM tool in a single three-day event to assess and identify opportunities to address problems with a specific production waste type (waste cullet reclaim).

4. GKN Sintered Metals:

- a. Developed a site-specific strategy for conducting the facility's E3 assessment via a Lean Manufacturing Kaizen Event to assess and identify opportunities to reduce energy consumption and environmental impact of the facility's compressed air system.

Develop and Present E3 Pilot Project Reports Detailing Efficiencies

The results and methodologies used for all of the E3 pilot projects have been documented in detailed reports for each company. (See **Exhibit C** for all 4 individual detailed reports)

Engage University Students in E3 Activities

Throughout the E3 Pilot program PennTAP engaged Penn State University students in various activities and site visits to provide hands-on applied E3 training opportunities. Some students participated as part of the classwork requirements for industrial site project visits. Many of the students also participated in training activities and helped with data analysis and calculations related to project implementation return-on-investment (ROI) reviews. PennTAP also supported an E3 partial Graduate Assistant (GA) with some of the funding from the E3 grant. This person assisted in various activities, along with researching and helping in the delivery of the training curriculum and session coordination.

Document E3 Pilot Project Implementation Results

The following table provides a summary of the individual company implementation results as well as a total summary of results for the entire E3 PA Pilot program under this grant funding. (**Exhibit D** has certain reported results tabulated in typical P2E2 spreadsheet format. PennTAP will continue to survey for results).

(Expected Results from Final E3 Reports of Implementation Recommendations)

Company	Elec. Reduction (kWh/yr)	Natural Gas Reduction (ccf/yr)	Cost Savings (\$/yr)	GHG Savings (Metric tons/yr) (* includes fuel source change affects)	ACTUAL \$s Invested (match) by each company through 9/30/2013 in E3 Pilot Projects
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Produce a Case Study / Success Story from E3 Pilot Project

See **Exhibit E** for a Case Study / Success Story written for Keystone Powdered Metals Company.

Conduct Meeting(s) to Formulate E3 Sustainable Plan for Pennsylvania

PennTAP was in close contact throughout the grant period with its partners NWIRC, WPPSEF, PADEP, and the four E3 PA Pilot companies. Throughout this period we learned various approaches that seem to work and some that did not. We participated in the various open dialog discussions that brought EPA Region III and IV together to discuss E3 results and best practices (June/2013 E3 Virtual Roundtable). We also gave feedback to EPA/PADEP via phone discussions and surveys and quarterly reports. In addition, we participated in the E3 Summit (Sept/2013) pulled together by USEPA with representatives attending from most of the E3 Partner Federal Agencies and other E3 grantees. All of these meetings had focus around the topic of sustainable efforts to keep E3 growing.

What we learned from our client contact, partner contact, and other agency partners and implementers was that E3 methods can be successful when embraced by industrial clients through the leadership provided by the E3 grant programs. We saw training acceptance and teamwork within our clients to be good once they were convinced of the soundness of the E3 approach. However, discussions with other implementers seemed to indicate that across EPA Region III and IV, there seems to be similar constraints in getting clients to participate in the program. We found that intense marketing and face-to-face meetings were needed to identify and convince our four client companies to participate. This was due to the limited knowledge they had regarding E3 concepts, as well as the constant battle for limited time with client stakeholders. We also found that getting companies to implement on E3 suggested savings strategies can be difficult due to competition for available business investment dollars. Projects with typically payback periods in excess of two to three years are difficult to get implemented by plant engineers, even though the calculations are solid on savings.

PennTAP has the following suggestions to help E3 become a sustainable program within PA:

1. More marketing messages are needed to build brand/program awareness around the E3 concepts. Cross linking E3 messages with other DOE, EPA or State Agency communications could possibly help.
2. Since electric utility providers are seeking to reduce load via ACT 129 in PA, we suggest that they be courted stronger as a USEPA Region III partner in E3 efforts. Many, if not most, E3 implementation recommendations are seeking reductions in GHG emissions via electric use reductions.
3. Companies respond to grant dollar match opportunities. Possibly a grant program designed around matching funding for projects with ROIs greater than two years might be worth discussion. This might help push more implementations on projects with longer ROIs, since most companies see the immediate value in funding less than two years ROI projects on their own.



4. The four companies we worked with were in need of a catalyst such as PennTAP and NWIRC to get them to move forward on the E3 effort. When a company knows that they are being followed and tracked on progress, it tends to push personnel to achieve higher goals and stay focused as a team. Unfortunately, this type of mentorship is not free and cannot be sustained without additional funding from the Federal Agency partners.
5. Co-marketing E3 with other energy efficiency or pollution prevention programs might help create more adoption of the E3 strategies. The low-cost, no-cost approach PennTAP has been teaching in its grant supported Building Retuning programs is a good way to provide assistance to clients at reasonably low cost – and then promotes broader and more strategic E3 concepts to these clients simultaneously.

Other Metrics Identified

1. Approximately 200+ companies were engaged in the PA E3 Pilot conversation either via marketing messages, face-to-face presentations, meetings and online webinars. From these contact points, approximately 25 companies were targeted for face-to-face discussions related to the eventual selection of the four pilot company plant participants.
2. Additional projects were identified outside of the E3 concepts during our program involvement. One project utilized a faculty member and graduate student to help research and design a new material to allow production of a part that one of our E3 PA Pilot companies had difficulty producing.
3. PennTAP assisted one client in procuring a \$170,000+ low interest loan commitment (for energy efficiency retrofit equipment) from the West Penn Power Sustainable Energy fund, based upon an energy efficiency implementation project identified via the E3 program. The loan will be paid back via the energy savings from the project.
4. Over 25 pilot company personnel were trained in various E3 methodologies during the completion of the four pilot programs. In addition, about 5 students participated in the training.
5. Over the course of this grant seven Penn State University students were involved in various site visits, project assignments, data collection and marketing projects to help complete some of the E3 PA Pilot deliverables.
6. This E3 PA Pilot program required a minimum of \$150,000 in matching funding from the PA Pilot companies that participated. As of 9/30/2013, the amount of matching company investment in the E3 Pilot projects was \$424,218; as reported by company executives. From discussion with company executives, PennTAP expects this investment match to come close to exceeding \$800,000 when all projects discussed for completion in the E3 final reports are implemented. (See **Exhibit F** for Company Investment Match Letters received to date).



4. Conclusions and Lessons Learned

Based upon the overall energy efficiency and pollution prevention projects identified within all four companies, the E3 PA Pilot project can be considered a success. Overall projected outcomes indicate that over 10,000,000 kWh/yr. in reduced electricity usage will be achieved via various methods, with an overall effect of reducing GHG emissions by 6,887 Metric Tons/yr. – all while saving the companies a combined \$498,000 / yr. in direct fuel costs.

Although it was difficult to initially identify companies to participate in the E3 Pilot, we found that once we achieved a commitment from upper management, the projects were supported and encouraged throughout the entire time frame. Of the four companies chosen for the E3 Pilot Program, three continue to remain engaged with PennTAP and continue to plan implementation strategies for the E3 recommended implementations. PennTAP, and our partner NWIRC, will continue to monitor all four companies for the next year and attempt to track their efforts to implement the remaining E3 pilot recommendations. In addition, we will be encouraging the companies to apply the new skills they have learned in ongoing efforts to focus on overall efficiency and pollution prevention within their operations.

The following is a list of “lessons learned” that may be helpful to other organizations as they implement future E3 programs with industrial clients:

1. We found that one of our clients is heavily committed to an energy and GHG emissions reduction strategy based upon flow-down goals of one of its major customers (reduction of 25% over time). This “supply chain effect” is worth noting as a marketing benefit when discussing E3 program start-ups with new SMEs.
2. Allowing clients to have a voice up-front in how the E3 assessments would be administered within their company produced a strong working alliance with them. Focusing E3 concepts on a known problematic facility “process” (vs. an entire plant review) was effective in getting all levels of client personnel focused, committed and involved.
3. Low interest loan assistance to entice project implementations was not a big incentive for any of the four companies we engaged. This is most likely due to the fact that the four companies we worked with were financially healthy and able to achieve similar financing options within their own lenders. However, specialized loan options that specifically allow for payback with “energy efficiency savings” were more attractive to SMEs. (See **Exhibit G** for WPPSEF loan application)
4. Due to the competitive nature of the industry in St. Marys, PA (where all four E3 Pilot Companies were located) it was difficult to drive involvement with community stakeholders outside of the SME organizations. Companies compete with each other and were reluctant to share ideas and strategies with their local community competitors.



5. Although most of the four companies we worked with had been aware of, and had implemented various lean principles in the past, their assessments had been limited to a focus on typical parameters such as activity value, number of operators, cycle times, changeover times, batch size and yield. Activities in which lean manufacturing assessment techniques were applied to an assessment specifically focused on energy and environmental issues was a new and exciting concept.
 6. The Value Stream Mapping (VSM) training and implementation exercise was something that allowed for all levels of plant personnel to work collaboratively. This built a “team” strategy among departments that we feel will provide benefits to the SMEs beyond the E3 Pilot Project. Cross-sectional company teams that were identified to participate in the E3 training and assessment walkthroughs often are continuing to meet due to the positive results they achieved during the E3 Pilot projects.
 7. Conference calls involving E3 grantees within EPA Region III and IV were very helpful in comparing results of our efforts and the hurdles we faced to greater success. We support this effort by EPA and encourage any future E3 initiatives to continue this dialog – and possibly engage grantees even earlier in the process.
 8. For SME’s, matching grant dollars are highly sought to help with longer term ROI efficiency project implementations. PennTAP suggests that a stronger alliance between the E3 initiative and statewide utility companies be formed. A possible “rebate or incentive” program focused on E3 approved implementations for energy reduction (that occurs over a longer time frame) might help drive more implementations.
 9. E3 promotion to large statewide philanthropic foundations whose mission is to reduce GHG emissions might be helpful in providing future efficiency grant dollars for implementation projects.
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